FEMA 209: 470335

ORIGINAL

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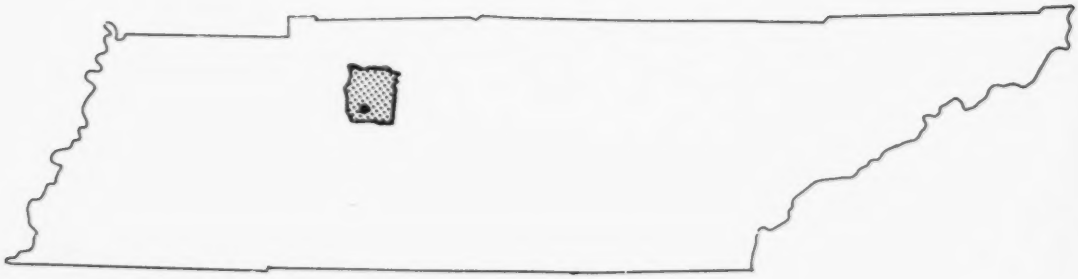
FLOOD INSURANCE STUDY

CITY OF DICKSON, TENNESSEE
DICKSON COUNTY



MAY 17, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 470335

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	1
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	4
2.4	Flood Protection Measures	5
3.0	ENGINEERING METHODS	5
3.1	Hydrologic Analyses	5
3.2	Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	7
4.1	Flood Boundaries	7
4.2	Floodways	7
5.0	INSURANCE APPLICATION	12
5.1	Reach Determinations	12
5.2	Flood Hazard Factors	12
5.3	Flood Insurance Zones	12
5.4	Flood Insurance Rate Map Description	13

BEST DOCUMENT AVAILABLE

TABLE OF CONTENTS - continued

		Page
6.0	OTHER STUDIES	13
7.0	LOCATION OF DATA	13
8.0	BIBLIOGRAPHY AND REFERENCES	15

FIGURES

Figure 1 -	Vicinity Map	3
Figure 2 -	Floodway Schematic	8

TABLES

Table 1 -	Summary of Discharges	6
Table 2 -	Floodway Data	9-11
Table 3 -	Flood Insurance Zone Data	14

EXHIBITS

Exhibit 1 -	Flood Profiles	
	Jones Creek	Panels 01P-02P
	Jones Creek Tributary	Panel 03P
Exhibit 2 -	Flood Boundary and Floodway Map Index	
Exhibit 3 -	Flood Boundary and Floodway Map	

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

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FLOOD INSURANCE STUDY
CITY OF DICKSON, TENNESSEE

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Dickson, Dickson County, Tennessee and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Dickson to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Nashville District, for the Federal Emergency Management Agency, under Interagency Agreement No. IAA-H-9-79, Project Order No. 13. This study was completed in March 1981.

1.3 Coordination

In November 1978, a meeting was held in the Dickson City Hall to determine which stream reaches within the City of Dickson required study and the method of study. Present at the meeting were representatives of the Nashville District, Corps of Engineers (COE), FEMA, and city officials. During the course of the study, coordination with city officials was maintained to insure acceptability of the final product.

The final coordination meeting was held on September 23, 1981 with representatives of the COE, FEMA, and the city in attendance.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Dickson, located in middle Tennessee. The area of study is shown on the Vicinity Map (Figure 1). Two streams with combined reach lengths of 4.39 miles were studied by detailed methods.

As agreed upon by the COE, FEMA and officials of Dickson, the streams selected for study by detailed methods were: Jones Creek from approximately 850 feet upstream of Spring Street, and Jones Creek Tributary from its mouth to Charlotte Street.

Approximate methods of analyses were used to study those areas having a low development potential or a minimal flood hazard. The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through March 1986.

2.2 Community Description

During the Civil War, c railroad was laid through the county, bisecting the present area of the City of Dickson. In 1865 a few crude buildings were constructed along the railroad track because there was a need for a railroad watering stop. By 1870 the settlement had a population of 150 people. During the 1870's a railroad line was constructed connecting Dickson with Centerville. Dickson began a period of growth and expansion during the next few decades.

Dickson had a population of 1,500 by 1893. The first industry located in Dickson was a stove factory employing a dozen men. A raincoat factory was founded in Dickson in 1925. The population of Dickson had grown to 3,000 people by 1925. By this time, the town had a power plant costing $250,000 and had many paved streets.

The depression in the early thirties struck Dickson very hard. The financial catastrophe caused the cigar factory, the raincoat factory, a bank, and several other smaller businesses to completely fail. By 1940, the population had only grown to 3,400 people.

The Town of Dickson remained rather static in growth from 1940 to 1945 due to the World War II economic situation. The growth (residential and economic) has been very rapid from 1945 to 1980. Dickson has emerged as an aspiring "new line" industrial center (paper, chemicals, and machines) as opposed to the past role as the agricultural retail trade center and "old line" industrial employer (textile mill products, apparel, lumber and wood products) for the county (Reference 1).

The City of Dickson is located in the west central area of the state, approximately 30 miles west of Nashville, Tennessee, and is the largest urban area in Dickson County. The 1980 census (preliminary) population of Dickson is 7, 019 (Reference 2).

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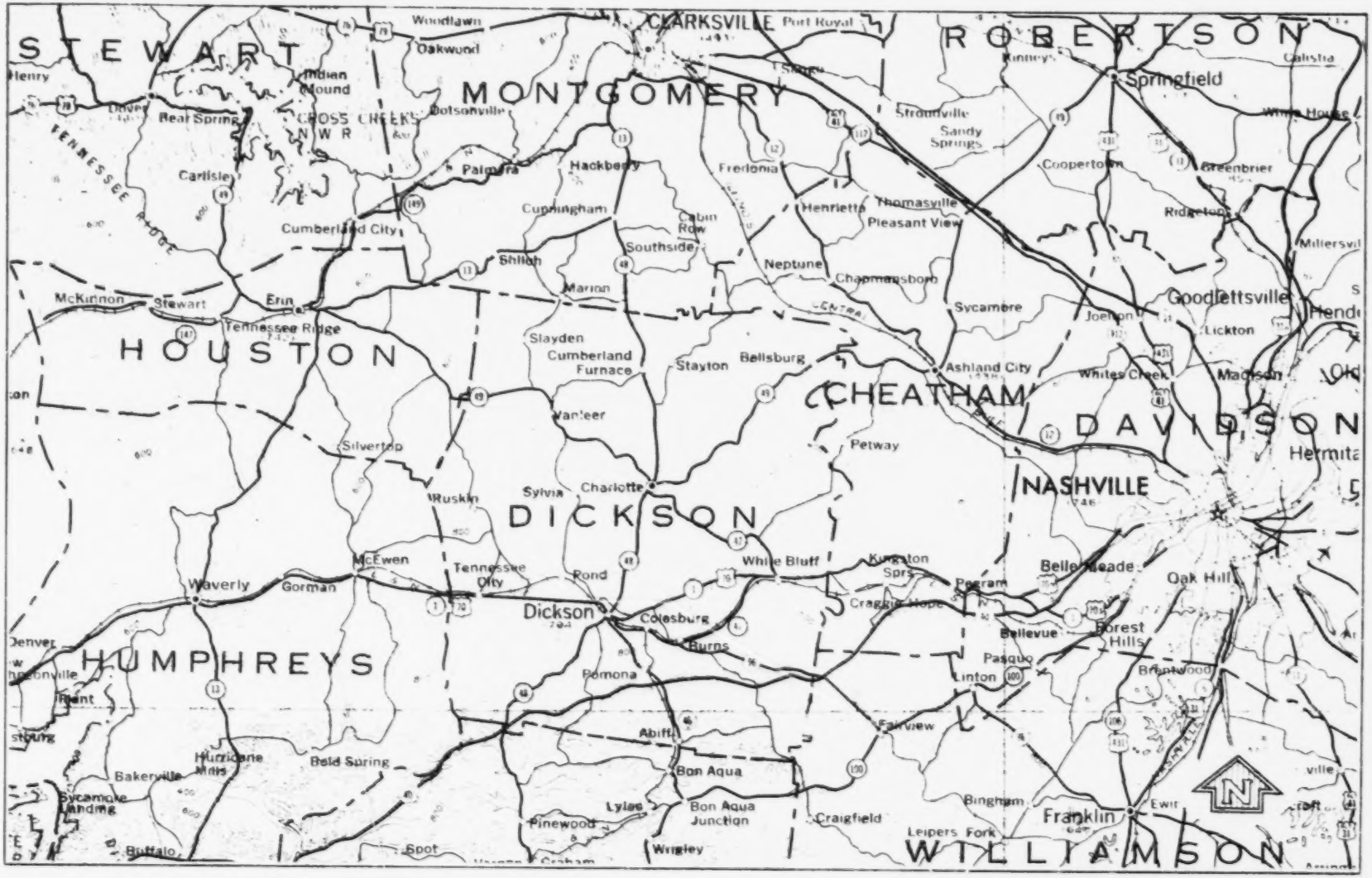

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN

(DICKSON CO.)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

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Jones Creek passes northeast of the city's central core and empties into the Harpeth River, which flows into the Cumberland River in northeastern Dickson County near Nashville. The creek flows northerly through the study area.

The creek drains an area of approximately 5.7 square miles while falling about 116 feet in elevation along its 4.22 miles long study area. The average slope through the study area is about 27.5 feet per mile, and the flood plain has an average width of 207 feet. The channel is 25 feet wide and the banks are 5-6 feet above the stream bed.

The Jones Creek Tributary flows in an easterly direction north of the central business district of the city which is a fully developed commercial and older residential area. This tributary drains an area of 1.09 square miles. Along its study length of .17 miles, the tributary falls about 4 feet. The average slope is about 17 feet per mile. The flood plain has an average width of 380 feet and the channel width averages about 25 feet. The stream banks rise about 3.5 feet to 5 feet above the stream bed.

Climatological data for Dickson indicates that temperatures vary from an average monthly low of 39 degrees F in January to an average monthly high of 80 degrees F in July. Precipitation ranges from 44 to 55 inches per year, the majority of which occurs in the winter and spring. Thunderstorms and local showers are frequent during the summer, with precipitation ranges from 44 to 55 inches per year, the majority of which occurs in the winter and spring. Thunderstorms and local showers are frequent during the summer, with precipitation being lightest in the fall (Reference 3).

Developments along Jones Creek are primarily residential and agricultural.

Generally the area surrounding Dickson is generally flat and low lying to gently sloping. Maximum relief within the area is about 950 feet.

2.3 Principal Flood Problems

Historic flood records for the City of Dickson are not available. However, the most critical flooding period is December through April when frequent, widespread, high intensity storms take place. The streams in the Dickson area are relatively small and subject to very rapid flood rises.

Three highway bridges cross Jones Creek in the study reach causing .50 to 2.0 feet head losses from the 100-year flood event.

There is one bridge across the Jones Creek Tributary in the .17 mile study reach. Here the head loss is about 1 foot, approximately 185 feet above its mouth.

Natural obstructions to flood flows include trees, streambank vegetation, rocks along channel banks, and a meandering alignment. Debris collecting on bridges also causes obstructions.

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2.4 Flood Protection Measures

There are no existing, authorized, or proposed Corps of Engineers flood control measures in the study area or upstream in the watershed of Jones Creek.

With the completion of the Flood Insurance Study, the City of Dickson will strengthen its flood plain management policies.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

The nearest stream gage is located at River Mile 21.9, but it is a low flow station having a short period of record.

Since no stream gage data exists for Jones Creek or the Jones Creek Tributary, frequency discharges were obtained by applying the USGS regional analysis dated 1975. This is a multiple regression method which uses numerous rain characteristics as parameters in deriving discharges. The discharges thus developed were checked and verified by an analysis of frequency rainfall versus verified unit hydrographs, with rainfall losses based on historical events.

Frequency discharge, drainage area relationships for Jones Creek and Jones Creek Tributary are shown in Table 1, "Summary of Discharges".

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There is one dam which impounds Luther Lake (Mile 26.0). Luther Lake drains an area of 0.6 square mile. It was studied under the Safe Dam Inspection Act and was found incapable of safely passing the 100-year event. Consideration was given to the effect of the dam on altering the inflow hydrograph. It was concluded that Luther Lake Dam would not significantly alter the inflow hydrograph and the frequency discharges used in the study.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Jones Creek					
Mile 26.00	2.29	846	1,339	1,572	2,671
Mile 26.98	0.92	438	695	817	1,477
Jones Creek Tributary					
Above tributary to Jones Creek at HWY 48	1.09	495	785	922	1,649

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations of the selected floods were computed through use of the COE HEC-2 computer program (References 4 and 5). Existing cross sections used in previous hydrologic studies were supplemented with field surveyed cross sections to facilitate more precise computations of floodway limits. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Boundary and Floodway Maps (Exhibit 3) as well as the flood profiles (Exhibit 1). Starting water-surface elevations for Jones Creek and Jones Creek Tributary were determined by slope-area method.

Flood profiles are drawn showing computed water-surface elevations to an accuracy of 0.5 foot, for floods of the selected recurrence intervals. Elevation reference marks used in this study are shown and described on the maps. All elevations are referenced to the National Geodetic Vertical Datum for 1929 (NGVD).

Roughness coefficients (Manning's "n") for these computations were assigned on the basis of previous studies by the COE, reconstitution of known flood events, and field inspection of the flood plains and channels of Jones Creek and the Jones Creek Tributary. Roughness coefficients for the streams streams studied in detail are contained in the following Table.

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Stream	Channel "n"	Flood Plain "n"
Jones Creek	.060-.075	.120
Jones Creek Tributary	.060-.080	.120

The acceptability of all assumed hydraulic structure data was checked by computations that duplicated historic flood profiles where available.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:12,000 with a contour interval of 5 feet (Reference 6). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 3). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

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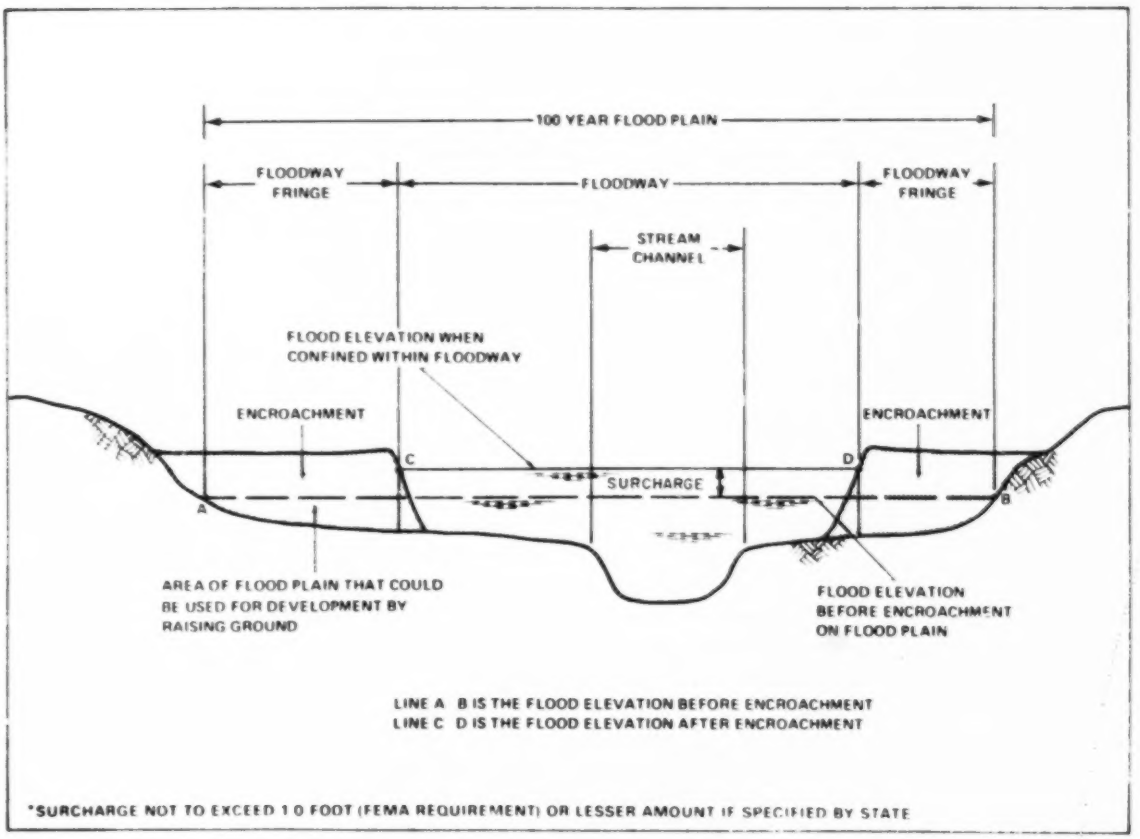
The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross secions for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC

Figure 2

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Jones Creek								
A[2]	0	276	1,599	3.0	631.6	631.6	632.6	1.0
B[2]	2,482	192	1,191	4.0	640.4	640.4	641.3	0.9
C[3]	5,333	118	963	4.9	651.8	651.8	652.6	0.8
D[3]	6,547	178	1,099	3.4	656.4	656.4	657.2	0.8
E[3]	6,869	96	628	6.0	657.1	657.1	657.9	0.8
F[3]	7,550	200	891	4.2	661.3	661.3	662.1	0.8
G[3]	8,923	333	1,472	2.5	669.7	669.7	670.7	1.0
H[3]	10,349	324	1,458	2.6	675.9	675.9	676.4	0.5
I[3]	11,827	375	1,663	2.3	679.7	679.7	680.7	1.0
J[3]	13,306	375	1,176	2.4	684.7	684.7	685.7	1.0
K[3]	13,527	199	670	4.1	686.0	686.0	686.5	0.5
L[3]	13,939	375	1,620	1.7	688.5	688.5	689.1	0.6
M[3]	15,523	405	1,200	1.8	691.5	691.5	692.4	0.9
N[3]	17,002	400	842	1.9	698.5	698.5	698.5	0.0
O[3]	17,957	196	686	2.3	703.6	703.6	704.4	0.8
P	18,744	126	398	3.0	709.1	709.1	709.8	0.7
Q	19,076	148	514	2.3	714.8	714.8	715.7	0.9
R	19,378	81	526	2.3	715.5	715.5	716.4	0.9
S	20,644	23	151	8.0	725.2	725.2	725.8	0.6
T	20,977	10	127	9.4	735.7	735.7	736.3	0.6
U	21,487	157	1,130	0.7	738.3	738.3	738.8	0.5
V	21,587	159	1,152	0.7	738.3	738.3	738.8	0.5

[1]Feet above downstream limit of detailed study
[2]Cross section not shown on Map, lies outside corporate limits
[3]Cross section lies outside corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN
(DICKSON CO.)

FLOODWAY DATA

JONES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Jones Creek (cont.)								
W	21,987	137	919	0.9	741.7	741.7	742.4	0.7
X	22,497	35	161	5.1	742.1	742.1	742.9	0.8

[1]Feet above downstream limit of detailed study.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN

(DICKSON CO.)

FLOODWAY DATA

JONES CREEK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Jones Creek Tributary								
A	106	235	1,060	0.9	715.5	715.5	716.5	1.0
B	173	38	216	4.3	715.6	715.6	716.6	1.0
C	264	193	1,013	0.9	716.8	716.8	717.8	1.0
D	898	29	133	6.9	718.5	718.5	719.4	0.9

[1]Feet above mouth

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN

(DICKSON CO.)

FLOODWAY DATA

JONES CREEK TRIBUTARY

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5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Dickson.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The location of reaches determined for the flooding sources of Dickson are shown on the Flood Profiles (Exhibit 1) and summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire area of the City of Dickson was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

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Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A2, A4, &A6:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Dickson is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

No other studies relating to the City of Dickson's flood hazard areas exist.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 1375 Peachtree Street, NE, Atlanta, Georgia 30309.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Jones Creek							
Reach 1	0002	-1.85	-0.48	+1.59	020	A4	Varies
Reach 2	0002	-1.24	-0.35	+1.34	010	A2	Varies
Reach 3	0002	-3.12	-0.91	+2.70	030	A6	Varies
Jones Creek Tributary							
Reach 1	0002	-1.17	-0.30	+1.03	010	A2	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN
(DICKSON CO.)

FLOOD INSURANCE ZONE DATA

JONES CREEK - JONES CREEK TRIBUTARY

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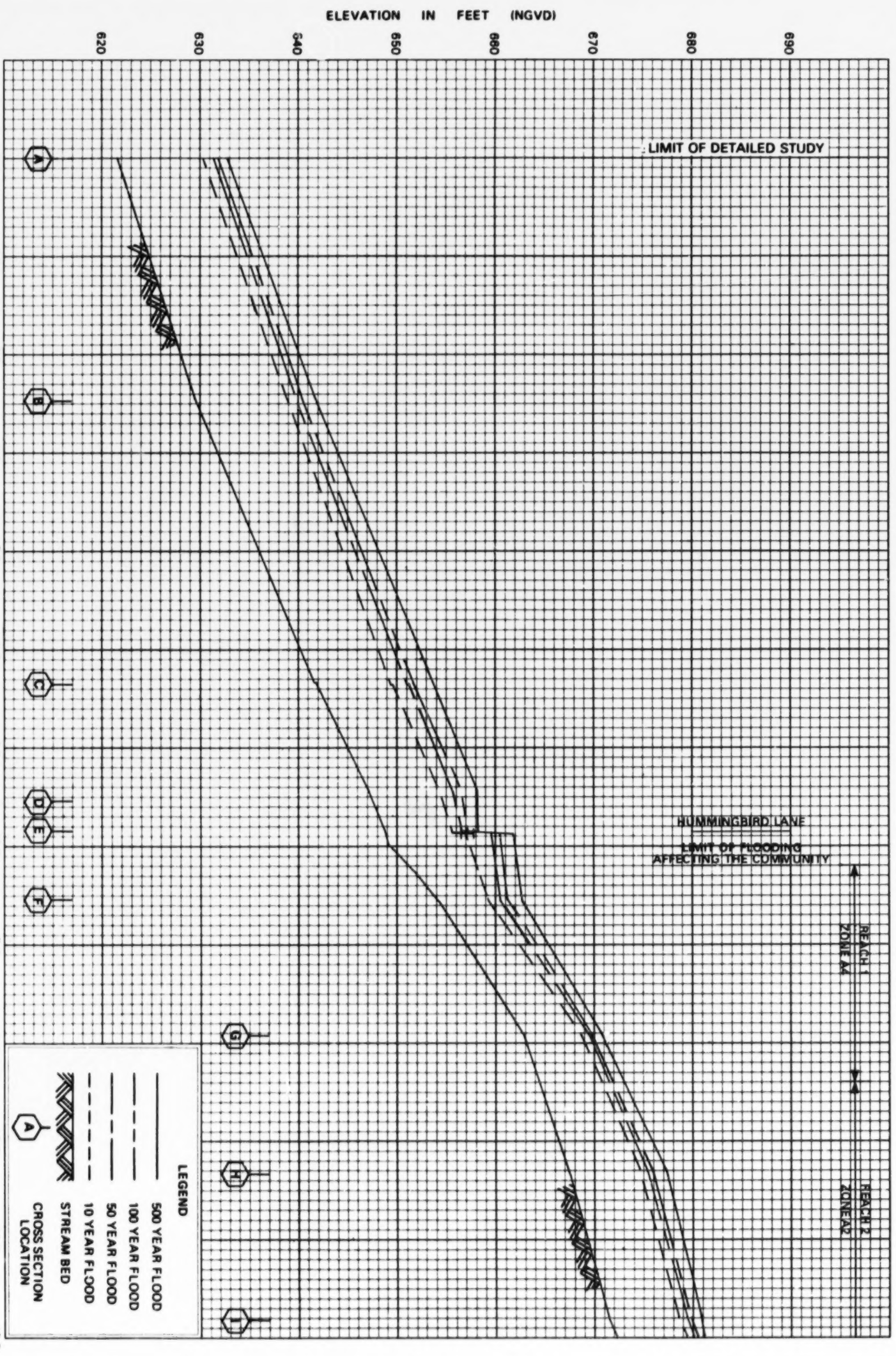

16

01P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF DICKSON, TN

(DICKSON CO.)

FLOOD PROFILES

JONES CREEK

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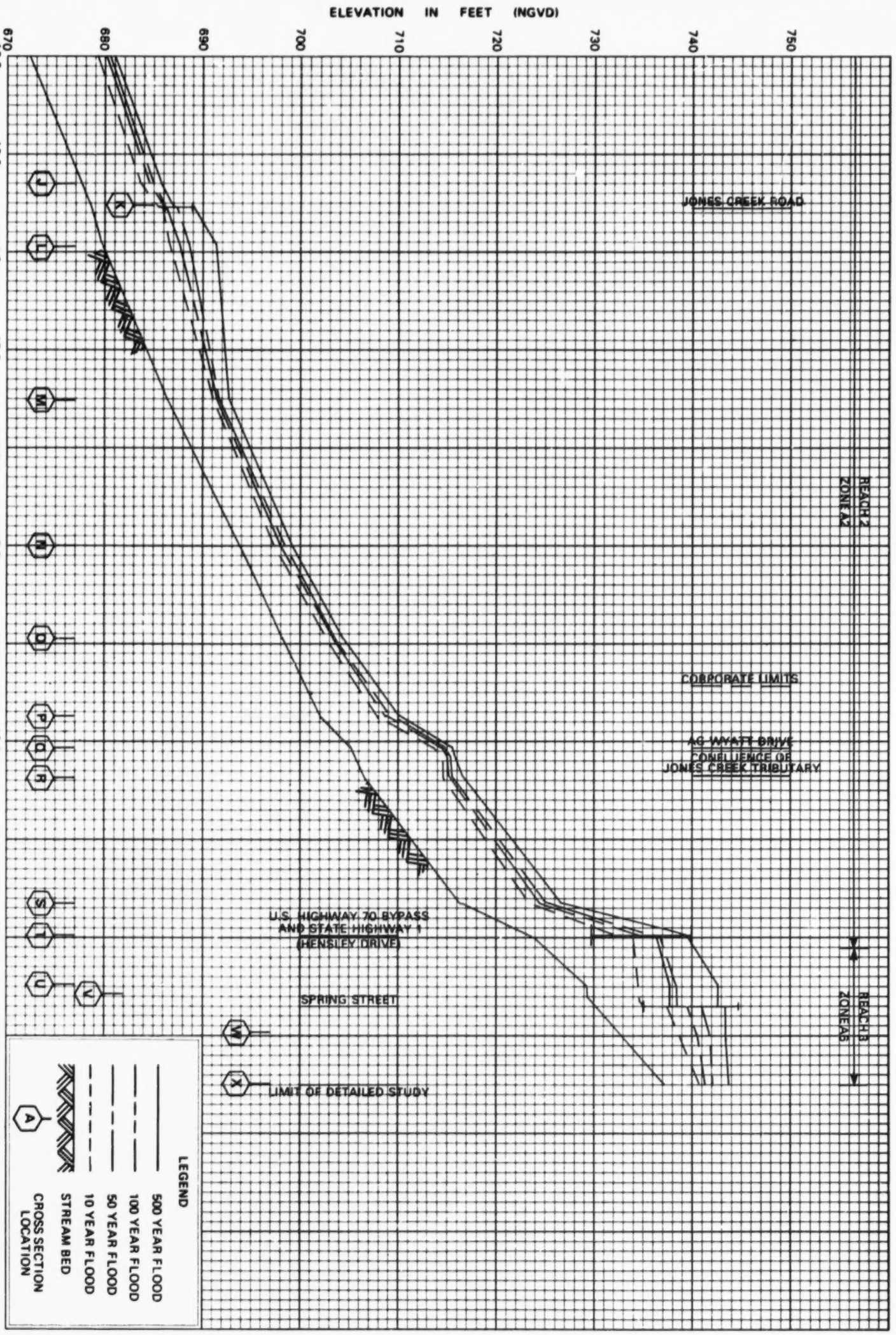

02P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF DICKSON, TN (DICKSON CO.)	FLOOD PROFILES JONES CREEK

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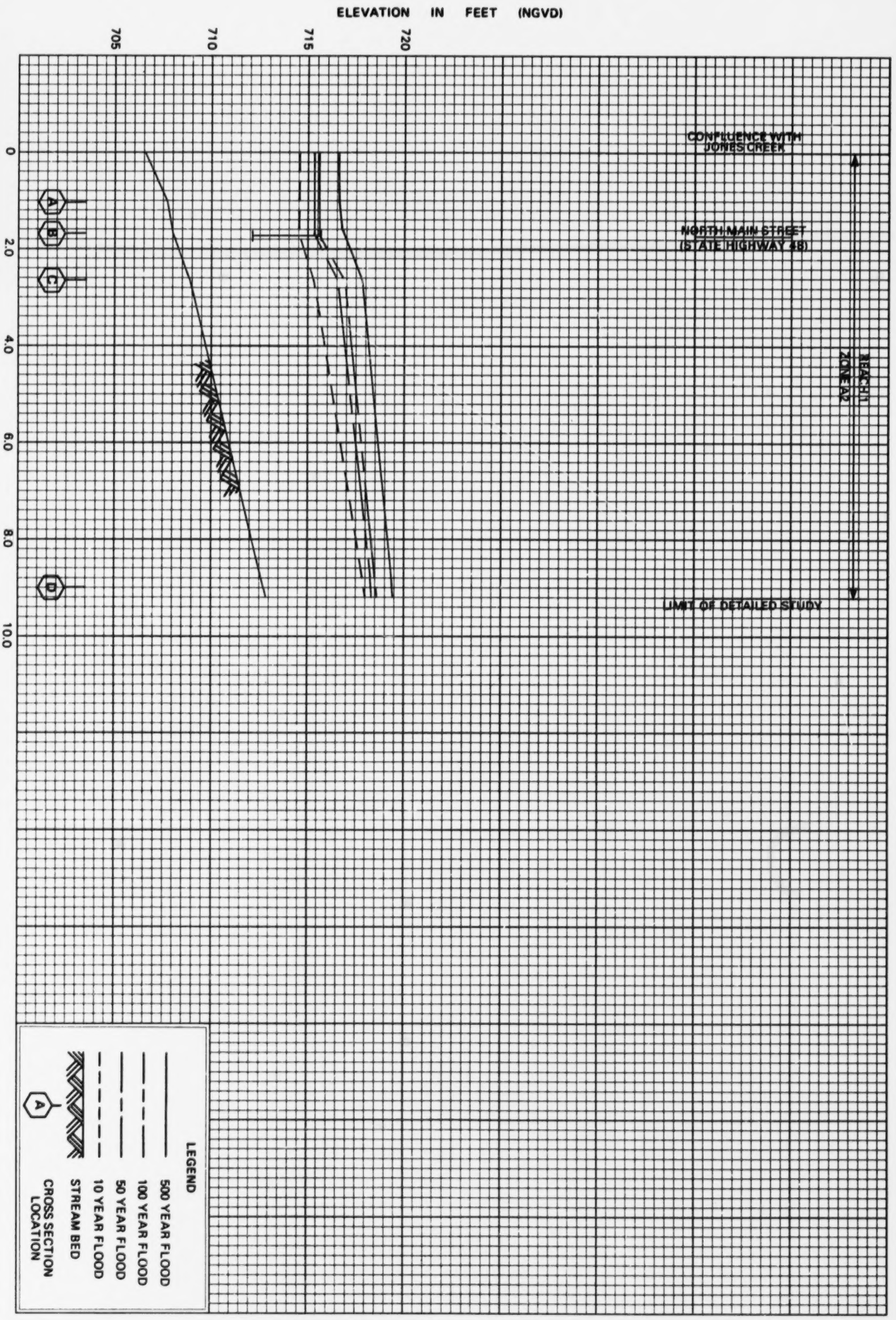

03P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF DICKSON, TN (DICKSON CO.)	FLOOD PROFILES JONES CREEK TRIBUTARY

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